Comments on "Summary of the Proposed California Toxics Rule" Prepared by CALFED Water Quality Program Distributed at October 1, 1997 WQTG Meeting

Submitted by

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Overall Comments

Overall, the information provided to the participants of the October 1, 1997 CALFED Wa Quality Program meeting on the proposed California Toxics Rule contains a number of errors inappropriate misrepresentation of issues.

It appears that the CALFED Water Quality Program is still focusing on using water quali criteria/standards-objectives as an approach for defining water quality problems that deser CALFED funding. As has been repeatedly pointed out by a number of individuals who have be following the CALFED Water Quality Program development, it would be a serious error f CALFED to continue to build its water quality programs around achieving a particular chemica specific, numeric criterion/objective. The California Toxics Rule criteria and state water quali objectives that evolve from these criteria should be used as a guide to potential problems; the should not be considered real problems because of the highly overly-protective nature of many the water quality criteria. In addition, for some constituents, such as chromium VI, the water quali criterion are highly under-protective, compared to that needed for controlling aquatic life toxici to key zooplankton.

There is a significant problem throughout the materials that were provided at the October 1997 meeting where pollutants are not distinguished from potential pollutants or chemica constituents. A pollutant by federal and state regulations is a material that impairs beneficial use A chemical constituent is not a pollutant until such an impairment has occurred. It is very importar to distinguish between the two, otherwise, significant over-regulation and waste of public funds wi occur.

Specific Comments

Page 1, paragraph 2, has *"(Alkalinity as $CaCO_3$)."* following "pH." The implication is that alkalinity is related to pH. That is not necessarily true. pH can change by orders of magnitude for the same alkalinity. Alkalinity is a measure of buffer capacity. pH is a measure of the hydrogen ion activity. The two are not the same. The revised summary dated 11-6-97 has deleted pH from the list of parameters of concern. This is appropriate except near acid mine drainage areas where low pH waters are discharged in sufficient amounts to be directly adverse to aquatic life.

The statement on page 2 under "Approach for Developing the Proposed Rule," second paragraph it states that for human health criteria, the criteria values are based on cancer potency factors. That is not the case for mercury.

Page 2, under "Derivation of Aquatic Life Criteria," the statement at the end of the first paragraph, *"The 1985 Guidelines try to provide a reasonable amount of protection with a limited possibility of substantial overprotection or underprotection."* That statement is not a reliable characterization of the approach that is used for developing water quality criteria. I was a member of the US EPA peer review panel that established the approach that was used for development of aquatic life criteria. The US EPA water quality criteria is designed to be worst-case or near worst-case criteria. They fail to properly incorporate aquatic chemistry and aquatic organism duration of exposure issues into their development and implementation. This results in significant over-regulation for many constituents of concern in most situations.

Page 2, last paragraph, the discussion about acute vs. chronic numeric aquatic life criteria which are expressed as short and long-term numbers rather than one number, is misleading with respect to the basic issues associated with acute and chronic toxicity. There has never been an issue of one number vs. two numbers. It has always been that there is acute toxicity which is manifested in lethality, usually related to a 96-hour exposure, and chronic toxicity which can be manifested in a number of ways ranging from growth to impaired reproduction, etc. which requires often weeks to months or more of exposure.

The statement is made this same paragraph,

> *"The two-number criteria are intended to identify average pollutant concentrations which will produce water quality generally suited to the maintenance of aquatic life and their uses and, at the same time, restricting the duration of excursions above the average so that total exposure will not cause unacceptable adverse effects."*

Again, this statement is not a reliable characterization of the situation. There is little consideration given to the magnitude of excursions that are allowable. There is no doubt that the one-hour and four-day numeric values which are used as the basis for implementing the criterion for acute and chronic exposures is an arbitrarily developed exposure period that arose out of an off-the-cuff statement made by one of the former scientists with the US EPA. It grossly over-regulates most

constituents of concern in water pollution control. Exposures above the criterion value can occur for at times considerably greater than those listed and still be protective of aquatic life. Several years ago I published an invited paper entitled "Appropriate use of Numeric Chemical Concentration-Based Water Quality Criteria" in the first issue of Human and Ecological Risk Assessment which discusses the significant problems with the way the US EPA has chosen to implement the water quality criteria into state standards and discharge limits. This paper is available from my website (http://members.aol.com/gfredlee/gfl.htm).

Page 3, second paragraph discusses how the criteria were developed using updated information. That is not true for mercury. Actually, the mercury values for human health protection are based on older data than is used in the current criteria.

At the bottom of page 4, the statement is made,

"In order to ensure that metals criteria are appropriate for the chemical conditions in the water in which they are applied, a 'water-effect ratio' (WER) procedure is contained in the proposed Rule. The WER procedure is used to compare the bioavailability and toxicity of a specific pollutant in receiving waters and in laboratory waters."

Contrary to this statement and its implications, those familiar with aquatic chemistry/toxicology understand that the water effects ratio approach used by the US EPA in an attempt to try to superficially address the effects of the water constituents on the bioavailability - toxicity of constituents. It does not properly adjust the criterion values for water effects on toxicity/availability. The basic problem is that the period of equilibration in the laboratory tests used to measure toxicity in ambient site waters is short compared to the conditions that exist in ambient waters. The net result is that many systems will not properly equilibrate in this short period of time, giving an over-estimate of the bioavailable forms that will actually occur in nature. A prime example of this situation occurs for copper in the San Francisco Bay where even after developing Bay specific water quality criterion for copper, there are still exceedances of the copper objective without toxicity to the same organism that was used to develop the objective. There is no question that the WEF procedure does not properly account for the characteristics of the water and the constituent of concern in impacting the beneficial uses of a waterbody.

Page 5, under "Mercury," only discusses the aquatic life toxicity issue; it does not discuss the bioaccumulation - human health aspects. This is a significant deficiency in this write-up since mercury is one of the, if not the only, heavy metal, with the possible exception of selenium, that is causing real water quality use impairments in the Delta. This error was corrected in the revised write-up.

Table 1 presents a summary of criterion values in the proposed California Toxics Rule. This table contains the same errors as has been discussed above for the individual parameters. Evidently Table 1 was deleted from the revised summary.

Table 2, "Comparison of Proposed California Toxics Rule Criteria to CALFED Water Quality Values," contains significant errors in all presentation of sediment values. The sediment values are Long and Morgan co-occurrence values. It is indicated in this table that these have been adopted by CALFED. I want to know when these sediment values were adopted and whether there was any public review of this adoption. I have provided CALFED Water Quality Program managers with detailed discussions of why they should not be using Long and Morgan values for determining critical concentrations of constituents in sediments. At a US EPA workshop on water quality criteria development held in St. Louis, Missouri in late August 1997, the US EPA headquarters staff, in discussing the approach being developed for revisions of water quality and sediment quality criteria/guidelines, indicated that the Long and Morgan co-occurrence values are correct, i.e. reliably predict toxicity correctly, about 50 percent of the time. Basically, it is possible to get the same reliability of Long and Morgan values co-occurrence-based values on predicting toxicity by flipping a coin. They are not reliable. There is no need to use them, and they should not be further mentioned by CALFED Water Quality Program as having credibility.

On page 2, 3 of the revision, under the discussion of mercury, there is no mention of the US EPA Region 9 guidance values for mercury that were developed for the San Francisco Bay. These values should be mentioned and considered as part of developing the CALFED Water Quality Program listing of constituents of concern and the concentrations that may be important. The US EPA has established a critical tissue concentration for mercury of 0.14 mg/kg wet weight for those who consume one meal of fish per week. Even this value is not protective for some of those who use fish from the Delta as an important source of their food. It is estimated by the Delta Keeper, Bill Jennings, that they consume Delta fish at least twice and possibly three to four times this amount. There is need to better understand fish consumption patterns in the Delta relative to the fish mercury content in order to establish appropriately protective mercury levels within fish.

This past week, I made a poster presentation entitled "Development of Technically Valid, Cost-Effective Hg Control for Sacramento River Delta & Upper San Francisco Bay" at the National Society for Environmental Toxicology and Chemistry meeting where I discussed a number of the Delta mercury water quality issues. A copy of the poster items has been provided to CALFED management, additional copies can be made available upon request. In that poster item I discussed the changes that will occur in the critical concentrations of mercury in water as the result of the US EPA's national mercury review that is currently underway. While at this time the US EPA criterion for mercury to prevent bioaccumulation is 12 ng/L, the California Toxics Rule will temporarily raise that level to 50 ng/L total recoverable mercury. However, as a result of the national mercury review the new mercury criterion that will be developed will likely be on the order of 5 ng/L total recoverable mercury. It is important to note however that the 12, 50 and 5 values will be significantly overprotective when applied to Delta waters since only part of the mercury that enters the Delta is in a bioavailable form. It is for this reason that CALFED should focus its mercury control programs on tissue concentrations which represent human health hazards based on US EPA screening values that consider the amount of mercury consumed by those who consume fish from the Delta.

The CALFED mercury discussions should have mentioned that for aquatic life impacts dissolved mercury is used. For human health impacts, total recoverable mercury is used.

The Long and Morgan mercury value for sediments listed on page 2 (revised page 3) is supposed to be based on impacts on organisms, not bioaccumulation which represents a human health hazard. There is no Long and Morgan value for sediments that relates to bioaccumulation. Further, even when applied to organisms and sediments, this value is technically invalid since it is based on total mercury under a co-occurrence relationship. There is no cause and effect relationship established between total mercury in sediments and the impact on organisms. Those familiar with mercury chemistry and toxicology know that mercury exists in sediments in a variety of forms, only some of which are toxic-available.

All of the discussions of sediment values for the chlorinated hydrocarbons have no validity since again, they were based on Long and Morgan co-occurrence values where there is a co-occurrence listing of supposedly adverse impacts on organism populations or some organism response. The constituents of concern in the chlorinated hydrocarbons are of concern because of bioaccumulation which does not cause an organism response. Basically, whoever assembled this table has mixed apples and oranges in an attempt to make a chocolate cake. It should be known with respect to mercury that the aquatic life toxicity values in the proposed California Toxics Rule are based on ambient water dissolved forms. While the proposed human health criterion is based on total recoverable mercury.

For the other metals the same kinds of problems occur as for mercury with respect to critical tissue concentrations appropriate sediment concentrations etc.

Under the footnotes, footnote "a" should be "100 mg/L as $CaCO_3$."

On page 8, the last footnote, "u," states, *"CALFED Representative Numerical Standards, Criteria, Objectives or Suggested Ranges are specifically inorganic mercury."* Again, when was this adopted by CALFED? To my knowledge, this was done without public review. The issue of concern with respect to mercury is organic forms, specifically methylmercury.

Comments on "Potential Tools and Indicators of Success for Assessing Effectiveness of CALFED Water Quality Actions"

The term "Water Quality Concentrations/Objectives" is introduced as a tool. It is not clear what is meant by a water quality concentration. This is a term that has no meaning in the water quality field.

The statement under "Strengths," *"Can be correlated directly to recreation, drinking water, industrial, and agricultural beneficial use impairments."* is not valid. There are poor correlations between the water quality objectives and actual use impairments for any of these parameters.

With respect to freshwater toxicity tests, it states, *"May detect toxicity from unknown causes when chemical tests do not reveal problems."* Chemical tests cannot reveal problems; they can only serve as an indicator of potential problems. Toxicity measurements actually are a direct measure of toxicity, which is much more reliable than trying to estimate it based on chemical concentrations.

The statement under "Weaknesses," *"Does not detect sub-lethal effects."* is not true. Toxicity tests can be and typically are run for chronic toxicity in which the emphasis is on sub-lethal effects.

The statement under current uses of non-point source assessments, I know of no toxicity tests that are used for that purpose. There are attempts to try to use this approach, however, thus far they have not been accepted as appropriate.

Under "Toxicity Identification Evaluation (TIE)," the write-up for "Strengths" is not valid. TIEs cannot detect possible environmental beneficial use impairments. TIEs are only useful to potentially identify the cause of toxicity.

The same error is made in "Strengths," *"May detect toxicity when chemical tests do not reveal problems."* CALFED is focusing on chemical concentrations, rather than chemical impacts. The public is concerned with chemical impacts i.e. use impairments. A chemical impact is toxicity.

The statement is made under "Weaknesses," *"Saltwater sediment TIE more developed than freshwater sediment TIE. Does not detect sublethal effects."* Neither type of TIEs for sediments are very well developed. TIEs can, in fact, detect sublethal effects if properly conducted.

For "Sediment Quality Concentrations/Objectives," again "sediment quality concentrations" has no meaning in the field. Does the author mean chemical concentrations vs. the objective values? Then he/she needs to write this in this way.

It is stated under "Applicable Parameters of Concern," that it is not applicable to chlorpyrifos. Is this because there is no Long and Morgan value? With respect to ammonia, Long and Morgan

chose to ignore a massive database on ammonia that was readily available to them in developing the co-occurrence values. This is one of the most significant weaknesses with respect to the Long and Morgan approach since ammonia is one of the primary constituents causing adverse impacts on organisms.

The "Sediment absorptive" term is an inappropriate characterization of binding in sediments. This section needs to be rewritten.

The statement is made under "Strengths," *"Sediment concentrations act as a long-term integrator for chemical loading to the immediate area and from upstream influences."* Such loadings have no relationship to water quality, however. It has been known for over 30 years that total concentrations of constituents in sediments is an unreliable predictor of impacts.

The statement is made, *"(DWR has compiled a report on these guidelines)."* Please provide a copy of this report.

The statement is made that the sediment quality concentrations/objectives are currently used for dredge reuse and disposal assessments. First, it is "dredged sediment;" we are not reusing dredges. There is no reliable use of Long and Morgan co-occurrence values for any purpose. They are not being used for dredged sediment management. The US EPA and Corps of Engineers developed biological effect-based testing procedures for dredged sediments in the 1970s. These biological effects-based testing procedures (direct management of toxicity and bioaccumulation) have been proved to be highly reliable. Long and Morgan values have been proven time after time to be unreliable predictors of water quality impacts.

Under "Freshwater Sediment Toxicity Test," for "Applicable Parameters of Concern," for chlorpyrifos and diazinon why is it not appropriate to do toxicity tests to determine if the concentrations of these constituents in sediments are in toxic forms? In fact, this is the only way to do this type of testing.

Under "Strengths," the use of the term "TIE" is inappropriate in the context presented. This section needs to be rewritten.

The statement under "Strengths" that toxicity tests *"Detects exposure to bioaccumulative substances."* again reflects a lack of understanding of basic water quality issues. Substances that bioaccumulate are rarely toxic to aquatic life except at much higher concentrations than those of concern for bioaccumulation.

All of the "Weaknesses" listed for Freshwater Sediment Toxicity Tests are equally applicable to any chemically-based approach. It is important to understand that the chemically based approaches such as water quality and sediment quality criteria, attempt to estimate toxicity and/or bioaccumulation. Toxicity tests directly measure toxicity and thereby eliminate the need to perform the unreliable activity of trying to estimate toxicity based on chemical concentrations.

Under "Tissue Concentration," it states that it is applicable to all metals and organics. That statement is inappropriate; there are only a couple of metals and a few organics for which this approach is applicable since there are few human health critical value concentrations available.

Under "Strengths," this section mixes together lethal toxicity issues and bioaccumulation. They are not related.

Under "Biological Assessment" it states *"Directly detects environmental beneficial use impairment/improvement."* That is not true in many situations. It is readily possible to get spurious results from biological assessments that have nothing to do with chemical contaminant impacts.

Overall, based on this and other write-ups, the CALFED Water Quality Program needs to hold more frequent meetings to discuss materials of this type. If it does not do this, it will likely encounter substantial opposition to its Program by the technical community knowledgeable in the topic area based on lack of technical validity and cost-effectiveness of the CALFED Water Quality Program.